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ABSTRACT

The instructor's packet, the first of two packets, is one of a series of materials designed to help students who are investigating the activities within a radiology department or considering any of the imaging technologies as a career. The material is designed to relate training experience to information studied in the classroom. This packet provides the following teacher materials for a clinical rotation: learning objectives and five references for the rotation, a student's weekly clinical rotation report, a clinical supervisor's evaluation sheet, the clinical rotation activity checklist based on the essential elements specific to an aide or assistant, a case study record, answer keys for the worksheets in the student packets, procedure sheets, and a section offering assignments for more advanced study, with answers. The students' packet provides student materials for use in the clinical rotation of a radiology and imaging course. The following materials are included: rotation objectives and a list of 5 reference materials, information on how to use the study packet, a clinical rotation activity checklist, 25 worksheets, a glossary of 54 radiologic terms, and a list of 6 career resources. The materials in both packets cover the following worksheet topics: radiology department personnel; radiation safety; hazardous materials; medical asepsis; transporting patients; body mechanics; linens and disposable supplies; communicating with patients; body cavities, directions, and planes; radiographs and imaging records; basic x-ray equipment; fluoroscopy; tomography and computer tomography; sonography; magnetic resonance imaging; nuclear medicine; patient records; charting; maintaining film supplies; maintenance of the darkroom; receiving and maintaining an inventory of supplies; conservation of supplies; equipment for processing; organization of the hospital; and the nature and production of x-radiation. (KC)

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RADIOLOGY/ IMAGING

Instructor's Packet



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CLINICAL ROTATION

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RADIOLOGY/IMAGING



CLINICAL ROTATION

Instructor's Packet

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Notes for the Instructor

The purpose of the student study packet is to provide individualized classroom study for a specific area of clinical rotation. As the student gains knowledge through the classroom activities, he/she will integrate this knowledge with the clinical rotation to enhance the learning experience.

The learning objectives for the rotation are given first, together with a list of reference materials that should be provided for completion of the Worksheets.

A Student's Weekly Clinical Rotation Report is provided for duplication. The form should be completed by the student for each week of rotation and returned to the instructor.

The Clinical Supervisor's Evaluation Sheet should be filled out by the supervisor of each department or service at the end of a rotation. The sheet is used to evaluate a student's performance and progress.

The Clinical Rotation Activity Checklist is presented in the student study packet. The list is based on the essential elements specific to an aide or assistant in each area. The lists are meant to be helpful to students and clinical staff in determining the experiences each student should have at a rotation station. The lists are also designed to document each student's progress. The list should accompany the student to each rotation, should be updated with each observation or skill practice, and should finally be signed by the area supervisor before submission to the health occupations teacher at the end of the rotation.

A Case Study Record is provided. The purpose of this form is to make students aware of the arrangement and content of a patient's chart. The instructor may decide whether it is appropriate for the rotation.

Answer keys for the Worksheets are provided. The instructor should select Worksheets from the student study packet appropriate to the clinical facility. The number of Worksheets selected is determined by the length of the rotation and will vary from program to program.

The next section contains Procedure Sheets. A chart shows the relationship of the procedures to the essential elements for nursing assistant, radiology. Procedures previously published are referenced. Other procedures are outlined in the publication, *Assisting in Radiology/Imaging*.

A section "For More Advanced Study" has been added. Additional assignments for each chapter in *Assisting in Radiology/Imaging* have been developed to employ higher level thinking skills requiring the ability to research and organize. Suggested answers are provided. This section may be used for concentrated study in Clinical Rotation, Health Occupations I or II.

No tests are provided. Because the length and content of a rotation varies greatly from one health care institution to another, no standard for testing exists. Test questions are available in the publications used as references. Instructors may select and devise a test from these.

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Rotation Objectives

Radiology/Imaging

The student involved in the radiology/imaging rotation will be allowed to observe and assist in the performance of as many departmental functions as possible. The student will apply knowledge gained from assignments to enhance the learning experience. The student will have an opportunity to relate radiology/imaging to patient care and the overall functioning of the health care system. The student will be able to make an informed decision when considering radiology/imaging as a career choice.

The student will be under the direct supervision of a professional licensed in radiology/imaging at all times.

The student will be provided opportunities to—

1. observe levels of training and responsibilities for different levels and modalities;
2. demonstrate an understanding of safety procedures to protect patients and workers;
3. state the functions of equipment in the radiology department;
4. observe and/or assist with transportation and preparation of patients for evaluation and treatments;
4. maintain supplies, equipment, and records as directed;
5. explain the use of radiopharmaceuticals in diagnosis and treatment; and
6. demonstrate an understanding of other imaging techniques besides radiography for the diagnosis of abnormal conditions.

Reference Materials

All reference materials are published by Educational Resources, EIMC, The University of Texas at Austin. The student will be provided the following reference for use in completing worksheets for the rotation in radiology/imaging.

- Fair, Helena J. *Assisting in Radiology/Imaging*. 1992.

One of the following publications will be needed for Worksheet 9: "Body Cavities, Directions, and Planes."

- Pape, Mark. *Physical Therapy Aide*. 1990.
- Williams, Catherine. *Applied Anatomy and Physiology*. 1985.

For additional information on imaging, use the following publication:

- Austin, Bobby, et al. *Introduction to Special Health Technologies*. 1989.

Student's Weekly Clinical Rotation Report

This form must be filled out on the Monday after a week of rotation. It should be given to your instructor during class.

Rotation Assignment

Date

Student Name

Supervisor

1. Summarize your responsibilities and duties this week.
2. Describe new information or skills that you learned.
3. Record the best thing that happened at the clinic this week.
4. Describe the worst thing that happened at the clinic this week.
5. If #4 was a mistake, how was it corrected?
6. This week was (circle one)
GOOD FAIR BAD DISASTROUS
Why?

Clinical Supervisor's Evaluation Sheet

Clinical Supervisor

Rotation Area

Student Name

Date

Please evaluate the student in the following areas. Use the following scale:

- 1 = Excellent
- 2 = Satisfactory
- 3 = Poor
- 4 = Unsatisfactory
- NA = Not Applicable

	<i>Score</i>	<i>Comments</i>	<i>Initials</i>
1. Participation	_____	_____	_____
2. Attitude toward work	_____	_____	_____
3. Behavior to patients			
greeting	_____	_____	_____
smile	_____	_____	_____
nonverbal communication	_____	_____	_____
helpful attitude	_____	_____	_____
4. Dress and appearance	_____	_____	_____
5. Punctuality	_____	_____	_____
6. Observes rules of department	_____	_____	_____

Additional Comments:

Case Study Record

Directions: Select one patient from this rotation. Obtain permission to examine the patient's chart. Complete this form with accurate data. Do not use a name. Write on the back or use additional paper, if necessary.

Sex _____

Age _____

Chief complaint on admission:

Present illness:

Physical findings (include important positive and negative findings);

Laboratory tests ordered:

Radiologic studies:

Cardiopulmonary studies:

Therapies ordered:

Medications:

Diagnosis:

Prognosis:

Suggested by Ruth Smith R.N., Plano East High School, Plano, Texas

Worksheet Answer Key

Radiology/Imaging

Worksheet 1: Radiology Department Personnel

1. radiologist—4 years of college, 4 years of medical school, internship, 2-5 years for a specialty; uses radiant energy to diagnose and treat diseases; M.D.
2. radiographer or radiologic technologist—2 years with an associate degree, 4 years for a bachelor's degree, pass test; operates equipment, prepares patients, produces x-rays for diagnosis; R.T. or R.T.(A.R.R.T.)
3. nuclear medicine technologist—one year for a registered radiologic technologist, 2 years for an associate degree, and 4 years for a bachelor's degree; performs examinations using radioactive substances; N.M.T.
4. radiation therapy technologist—1 year with a background in the health field, 2 years for an associate degree; administers radiation to treat patients: R.T.T.
5. diagnostic medical sonographer or ultrasound technician—one year with experience in the health field, 2 or 4 years for a degree; prepare patients for procedures, maintain equipment, keep records.

Answers to questions 6, 7, and 8 will vary with the locality.

Worksheet 2: Radiation Safety

1. Ionizing radiation occurs naturally by the decay of radioactive elements and through the use of x-rays.
2. skin, eyes, blood-forming tissues, gonads
3. The genetic effect causes damage to the chromosomes while the somatic effect refers to damage caused to tissue.
4. Scattered radiation results from the x-ray beam being deflected or bounced off tissues.
5. film badge, thermoluminescent dosimeter
6. The farther away one is from the source of radiation, and the shorter the time of exposure, the less the amount of radiation. If protected by a dense object or shield, radiation is less able to reach the person.
7. aprons, gloves, and gloves of vinyl or rubber and containing lead
8. use of sandbags, compression bands, or having a relative hold the patient
9. The cumulative radiation exposure may be dangerous to personnel who work with x-rays.
10. to reduce radiation exposure of workers in hospitals
11. Mark rooms housing sources. Allow only authorized personnel in the area. Enclose sources. Maintain contamination control boundaries.
12. with radiation monitors, door interlocks, visual alarm systems
13. no; kept closed
14. patient and trained personnel
15. annually
16. if exposure were extended and elevated consistently

Worksheet 3: Identification of Hazardous Materials

1. on the outer door of any facility that has hazardous wastes and any room where hazardous wastes are used or stored
2. to allow emergency personnel to determine problems quickly

3. a. Health Hazard b. Flammability c. Reactivity
4. to identify other hazards
5. radioactive materials and radiation-producing machines
6. yellow with the three-bladed propeller symbol for radioactivity in purple or red
7. on the patient, the chart, and the bed
8. to monitor exposure levels of patients and workers, maintain an inventory of all radioactive substances which enter and leave a hospital, train those who handle radioactive substances
9. Answers will vary.

Worksheet 4: Medical Asepsis

1. prevention of the spread of disease from one person to another
2. shield of radiation-absorbing material, materials used to prevent spread of disease
3. indirect, direct, enteric
4. practicing good health habits; getting rest; washing hands; and using masks, gloves, and gowns for isolation
5. cleaning work surfaces with disinfectant, proper disposal of one-use supplies, discarding sharps into puncture-proof containers

Worksheet 5: Transporting Patients

1. stretchers, wheelchairs, ambulation
2. three or four
3. a. Keep patient covered as much as possible.
b. Do not leave unconscious patients or children alone.
c. Fasten the restraint belt.
d. Raise side rails.
4. a. minimal—holds assistant's elbow or hand
b. moderate—assistant places arm around patient's waist; may hold patient's hand
c. more-than-moderate—two people; one on each side of patient
5. Leave tubes connected, and move them with the patient. Keep drainage unit below level of patient's bladder. Keep IV fluid containers above patient by attaching to a standard placed into the stretcher.
6. either
7. Ask patient to place hand on wheelchair.
8. that patient is covered and safety belt is fastened
9. The patient is sitting on side of bed with feet and legs hanging off bed.
10. around assistant's shoulders

Worksheet 6: Body Mechanics

1. It refers to the principles of proper body alignment, movement, and balance.
2. proper relationship of one part to another
3. to prevent injuries such as muscle or backstrain, less tiring, avoidance of other injuries
4. It is firm and stable.
5. center of gravity. The line of gravity passes through this point.
6. portion of body in contact with floor
7. (1) center of gravity, (2) line of gravity, and (3) base of support

8. a. Stand with feet parallel, at right angles to lower legs, and from 4 to 8 inches apart.
- b. Keep knees slightly bent.
- c. Keep buttocks in and abdomen up and in.
- d. The head should be held erect.
9. a. Provide a base of support with the feet separated and one foot slightly ahead of the other.
- b. Distribute weight evenly on both feet.
- c. Keep work close to body to avoid stretching and reaching.
- d. Work at a comfortable height.
- e. Use smooth, coordinated movements.
10. in short, simple commands
11. back stress
12. push or pull them

Worksheet 7: Linens and Disposable Supplies

1. from least afflicted side
2. the afflicted side
3. taken to an area for safekeeping or taken with the patient to the procedure room
4. Check dressing room. Put soiled gowns in the hamper. Discard paper products. Replenish supplies.

Answers to questions 5 through 9 will vary with the facility. The instructor should evaluate these for accuracy.

Worksheet 8: Communicating With Patients

1. "Radiology Department, Miss/Mr. (your name)"
2. children, elderly, disabled, visually impaired, hearing impaired
3. Introduce yourself. Offer to help. Guide to chair in waiting room. Explain delays. Escort to dressing room and to procedure room. Provide a hospital gown. Help dress, if required.
4. Get attention. Face the person, and speak clearly. Use gestures, sign language, or written notes. Ask to repeat if not clear. Use interpreter.
5. communication without words
6. with facial expressions and gestures
7. to explain them to patients when making appointments for the examinations
8. The nurse in charge of the patient's floor prepares the inpatient. In the case of outpatients, the radiology personnel schedule the appointments and explain the preparations.
9. all information concerning the patient
10. a physician
11. to the use of this information for treatment and transmission to a chosen physician

Worksheet 9: Body Cavities, Directions, and Planes

- Figure I:
- A. cranial cavity
 - B. vertebrae
 - C. thoracic cavity
 - D. diaphragm

- Figure II: E. spinal cavity
F. abdominal cavity
G. pelvic cavity
A. cranial
B. posterior or dorsal
C. anterior or ventral
D. frontal plane
E. caudal
- Figure III: A. sagittal plane
B. transverse plane
C. proximal end of lower leg
D. lateral surface
E. medial surface
F. distal end of lower leg

Worksheet 10: Radiographs and Imaging Records

1. intravenous pyelogram, KUB, nephrogram, nephrotomography, pneumocystogram, renal sonogram, ureterogram, urethrogram, urogram
2. (a) motion picture; (b) cineangiocardiology—to record heart structure and movement and cinecystogram—to study urinary function, especially the bladder.
3. The cholangiogram shows the bile ducts, and the cholecystogram shows the gallbladder.
4. kidney, ureter, bladder
5. a. x-ray
b. ultrasound
c. tomography
d. CT scanning
e. nuclear medicine
f. x-ray
g. ultrasound
h. x-ray
6. air contrast enema examination, barium enema examination, lower gastrointestinal examination
7. air, carbon dioxide, pelvic pneumogram
8. colon, spinal cord and canal, joint, bladder, ventricles of brain
9. liver
10. flat plate of chest, chest flat plate, or chest film
11. breast

Worksheet 11: Basic X-ray Equipment

1. Wilhelm Konrad Roentgen
2. tube stand, control panel, generator, table
3. tube stand
4. Answers will vary.
5. to position and lock the tube stand in place
6. to allow the radiographer to change the features of x-ray output
7. Answers will vary but should include location behind lead shielding.
8. to produce high voltage and x-radiation

9. positioning the patient
10. The kidneys lie behind the intestines. The intestines must be free of gas and fecal material in order to visualize the kidneys after injection of the radiopaque material.
11. Contrast media consist of substances administered to render body structures visible by contrast in the density of the structure and its surrounding tissues.
12. barium sulfate, iodine, radioactive substances, air
13. allergic reactions of patients
14. flushing, metallic taste, itching, and shortness of breath after injection or ingestion

Worksheet 12: Fluoroscopy

1. observation of an x-ray image on a fluorescent screen
2. The radiologist can watch the movement of various organs in the body.
3. greater radiation exposure to patient and workers
4. using a screen intensifier with protective leaded glass; using television monitors and remote control devices so workers can stay outside the procedure room
5. A spot film is an x-ray taken during fluoroscopy of a specific structure.
6. a. The patient drinks the barium sulfate while the radiologist fluoroscopes. The technologist takes a series of radiographs of the stomach.
b. The technologist begins the examination by inserting an enema tip. The radiologist fluoroscopes the patient and watches the colon as it is filled with barium sulfate. The patient evacuates as much of the barium sulfate as possible in the restroom. The technologist takes a final radiograph.

Worksheet 13: Tomography and Computed Tomography

1. The x-ray tube and x-ray film are moved in opposite directions during exposure.
2. The area of interest appears sharp and clear. Other structures are blurred.
3. It uses a computer to construct a cross-sectional image. Tomography produces an image parallel to the long axis of the body while computed tomography produces a cross-sectional image. Computed tomography produces photographs, while tomography uses x-ray film.
4. to support a patient moved in on a table and to house components used in imaging
5. head scans, body scans
6. injury, neoplasms, inflammation
7. tomogram

Worksheet 14: Sonography

1. Sonography is the use of ultrasound to produce an image of a body structure.
2. sonogram
3. photographs, x-rays, videotapes—black-and-white photographs are most common
4. computers with viewing screen and adjusting devices, probes, photographing device

5. The transducer changes electrical impulses into sound waves which are bounced off body tissues. The probe receives the sound back from the tissue which can be measured and used to produce images.
6. female pelvis, gallbladder, kidneys, male pelvis, thyroid gland, knee
7. High-frequency ultrasound is used to break up gallstones or kidney stones.
8. the heart, echocardiogram
9. to measure blood flow in the circulatory system
10. a. abdominal echogram—ultrasound studies of the organs in the abdominal area.
 b. contact scanning—ultrasound studies done with direct skin contact through a coupling gel.
 c. echogram—photograph produced by ultrasound.
 d. echoencephalogram—visualization of brain structure by ultrasound.
 e. gynecologic ultrasonogram—use of ultrasound to detect abnormalities of female reproductive system, fetal placement, or presence of lesions.
 f. hepatic echogram—ultrasound photograph of the liver.
 g. nephrosonogram—use of ultrasound to visualize kidneys.
 h. obstetric ultrasonogram—sonogram showing fetal abnormalities and placement.
 i. renal sonogram—use of ultrasound to visualize kidneys.
 j. ultrasonogram (Doppler)—using ultrasound to measure blood flow.

Worksheet 15: Magnetic Resonance Imaging

1. a modality using properties of atoms within the body to create diagnostic images
2. a. Both have a gantry to support patient and house equipment.
 b. The MRI gantry is larger with a relatively smaller tunnel opening for patient entry.
 c. CT scanner gantry has x-ray tubes and detectors; MRI scanner has a large magnet, radio-frequency transmitter coils, and other electric equipment.
 d. Both need computers and controls.
3. The magnet is used to align the hydrogen atoms of the body. The radio-frequency transceiver transmits a radio-frequency signal. It picks up the signal released by atoms within the body. The gradient coils allow the technologist to program the computer to produce the images needed.
4. anyone with any metal in his/her body, steel workers, those with pacemakers, claustrophobics
5. faster, more body planes, no radiation

Worksheet 16: Nuclear Medicine

1. for diagnosis and treatment
2. ingestion, injection, inhalation
3. to detect the amount of gamma rays given off at the organ site
4. The gamma rays from the patient strike the crystal in the camera. The rays are recorded as flashes of light. Electronically, the light given off from the camera is changed into a picture on a TV screen. It is also recorded on photographic film.
5. A gamma camera may also be called a *scintillation camera* since it records the gamma rays as flashes of light as they strike the crystal.

6. A piece of equipment used to evaluate body fluids from patients who have received radioactive material.
7. the emissions from radioactive substances given to patients
8. thyroid uptake, bone scan, lung scan, heart scan
9. scintigram, scintiscan, scan, photoscan, scintillation scan
10. oral administration of radioactive iodine for studies of the thyroid gland
11. A photoscan is recorded on x-ray film. A scintillation scan is a pattern recorded by a scintillation counter.

Worksheet 17: Patient Records

1. a physician
2. the physician records—dates of order and when to be done, examination desired, physician ordering, and clinical information about patient
the department records—film size, who ran the procedure, and other remarks
3. Answers will vary.
4. whether patient has had previous radiographic examinations
5. case number, date and type of last radiographic examination
6. placing lead letters and numbers on the cassette; using radiopaque tape
7. case number
8. There are three groups of numbers, two in each group. The radiographs are filed by the last two numbers, then by the first number of the second group.
9. If answer is "no," then another system must be explained.
10. four; one copy into patient's jacket with radiographs, one copy in a file, one copy on patient's hospital chart, and one copy to patient's doctor
11. information card, radiographs, radiologist's report

Worksheet 18: Charting

1. doctor's order sheet, graphic chart, medical history and physical record, progress notes, nurse's notes, summary sheet, medication report, routine clinical laboratory reports
2. into a section for special or diagnostic procedures
3. Dr. Smith ordered a gastrointestinal series on Mrs. Black.
4. The radiologic technologist was asked to perform a computed tomography scan.
5. Magnetic resonance imaging and computed tomography are forms of imaging.
6. Kilovolt peak, kilovolt, and milliamperage are important in controlling the generator which produces x-radiation.
7. Both the Food and Drug Administration and the National Regulatory Commission regulate radioactive materials with which the nuclear medicine technologist works.
8. An intravenous pyelogram was scheduled for Tuesday.
9. Maximum permissible dose information travels with the radiologic technologist when the radiologic technologist changes jobs.
10. The focal film distance and source-to-image are both distances measured from the point of origin of the x-rays.
11. A unit of measurement of wave frequency is the hertz.

Worksheet 19: Maintaining Film Supplies

1. The film is a transparent polyester plastic sheet coated on both sides with an emulsion of gelatin and silver salts. On each side of the base is a layer of adhesive. Above the emulsion is the layer of gelatin called the supercoating.
2. silver halide suspended in gelatin
3. screen film—used in cassettes with intensifying screens
nonscreen film or exposure film—used to photograph small body parts
4. a. dental film for examining teeth
b. dental film for locating cavities and examining relationship between upper and lower teeth
c. used to examine large dental areas
d. film for kidney surgery individually packaged to allow for sterilization; used to study kidney function
e. used to register radiation dosage for personnel monitoring
f. for producing exact copies of radiographs
5. It has emulsion coated only on one side of the base.
6. 40% to 60% relative humidity, temperature of 50° to 70°F
7. Store in lead-lined containers. Do not store close to drugs or vapors. Do not stack, wrinkle, or bend. Store boxes of film on edge. Use before expiration date.
8. It is a lighttight holder for film to allow radiation to pass through.
9. 14" x 17", 11" x 14", 10" x 12", 8" x 10", 6 1/2" x 8 1/2", 5" x 7", 7" x 17", 9 1/2" x 9 1/2"
10. The front is made of metal or plastic. The back is aluminum or stainless steel.
11. a device that converts the energy of the x-ray beams into visible light; found in the cassettes
12. A layer of the intensifying screen that converts the energy of the x-ray beam into visible light
13. They must be cleaned often using a soft cloth, cotton balls, or gauze squares moistened with either screen cleaner or soap and water.

Worksheet 20: Maintenance of the Darkroom

1. a. grey, maroon, or brown; stainless steel or formica
b. ivory cream, beige, buff, or pale shades; ceramic tile
c. color to blend with walls; ceramic or asphalt tile
2. Answers will vary.
3. The wet side has the processing tanks, automatic processor, and a sink. The dry side has the film bins, transfer cabinets, and compartments for cassettes and other items grouped around the loading bench.
4. 67° to 78°F with 60% humidity
5. White light is needed for cleaning and mixing chemicals. Safelight is used when processing film.
6. a white light bulb covered by a red safelight filter
7. so cassettes won't be accidentally opened by bumping together
8. a metal bin with multiple divisions, sized to hold film and located under the loading bench
9. White lights go out automatically if the door to the bin is opened.
10. with the box on its edge

11. When supplies are low, the assistant should report to the supervisor or place needs on a list. New supplies are placed to the back so those with older expiration dates are used first.
12. (1) Keep it free of dust by dusting and mopping frequently.
 (2) Wipe up spilled chemicals.
 (3) No smoking in the darkroom
 (4) No eating in the darkroom. (Any three of these)

Worksheet 21: Receiving and Maintaining an Inventory of Supplies

1. close to supplies posted on a wall cabinet or door or placed in a drawer
2. name of supply, present number on hand, the reorder point
3. when an item should be reordered as determined by a variety of factors
4. It can easily be updated daily.
5. if the staff is unwilling to update the list as supplies are used
6. Answers will vary.
7. either an invoice or a packing slip
8. A packing slip lists only the contents of a package, while an invoice lists contents, prices, and the total charge.
9. Check the invoice or packing slip against the contents of the package to be sure every item is there and undamaged. Check charges on invoice against order. Date and initial, as directed. Place invoice or packing slip in tray or folder.

Worksheet 22: Conservation of Supplies

1. The pumps are activated, and replenisher is pumped into the tanks.
2. The film passes the entrance assembly.
3. to prevent over- or underreplenishment of developer
4. a. 8" x 10", 7" x 17"
 b. 17"
5. removing silver from the fixer
6. from the silver halide in the film
7. When the film is placed in the fixer, the unexposed, underdeveloped silver is cleared from the film into the fixer solution.
8. to conserve silver, to increase profits, and to prolong the life of the fixer

Worksheet 23: Equipment for Processing

1. film-feeding section
2. film-processing section
3. film-drying section
4. 95°F, 25 sec.
5. 95°F, 21 sec.
6. 98°F, 9 sec.
7. 120°F, 20 sec.

Worksheet 24: Organization of the Hospital

1. to make policy, establish goals, and govern a hospital
2. the hospital administrator
3. Answers will vary with the facility.
4. department head
5. for effectiveness and efficiency

6. a physician
7. nurses, therapists, diagnostic workers, dietitians, social workers, pharmacists, record keepers

Worksheet 25: The Nature and Production of X-radiation

1. electromagnetic
2. in a wavelike motion in all directions around the source
3. the ability to penetrate materials that absorb or reflect other types of electromagnetic radiation
4. in straight lines at 186,000 miles per second
5. They are invisible, cause some substances to fluoresce, are electrically neutral, and cause biological changes in humans.
6. when fast-moving electrons strike a target
7. The electrons are produced by heating a coil of tungsten wire. A high voltage is applied. The electrons accelerate toward a positively charged target called the anode.
8. tungsten
9. Only 0.2 percent becomes x-ray energy. The remainder is converted to heat.
10. cathode, anode, glass envelope
11. used to guide electrons to the tungsten wire in a stationary anode tube
12. the area of the target where the electrons strike in the rotating anode type of tube
13. It is made of Pyrex glass and contains a vacuum.
14. milliamperage selector
15. kilovoltage selector
16. timer

Essential Elements and Procedures for Radiology/Imaging

The essential elements for nursing assistant, radiology are listed on the left. Procedures are listed or referenced on the right by page number. Other procedures in the reference are listed below.

ESSENTIAL ELEMENTS	PROCEDURES
(1) transport patients to treatment unit	Transporting a Patient by Stretcher, p. 23 Transporting a Patient by Wheelchair, p. 24 Transporting a Patient by Walking (Ambulation), p. 25
(2) assist with robing and disrobing	Donning a Hospital Gown, p. 27 Removing a Hospital Gown, p. 28 Communicating with Special Patients, p. 29
(3) change linen and clean room	Checklist for Care of Dressing Room, p. 31
(4) record pertinent information in the patient's chart	Checking for Accuracy of Patient Data, p. 33
(5) adjust inventory and supplies as directed	Rules When Lifting Heavy Objects, p. 35
(6) maintain inventory and supplies as directed	The Running Inventory, p. 37 Receiving Supplies, p. 38
(7) prepare and maintain work area	General Control Measures for Radiation Exposure, p. 39 <i>Assisting in Radiology/Imaging</i> Unit 8, Wire Mesh Test Unit 9, Test for Safelight
(8) distribute radiograph reports to appropriate unit for placement on patient's chart	The Patient's Chart, p. 41
(9) assist in record keeping	Abbreviations Used in Radiology/Imaging, p. 42

The following procedures can be found in *Assisting in Radiology/Imaging*, Student's Manual. The procedures are listed by unit and in order of occurrence.

Unit 4, Protection from Radiation and Infection	Occupational Exposure (Computing MPD)
Unit 5, Radiology Office Records and Procedures	The Telephone Table 1. Typical Preparations for Radiographic Examinations
Unit 6, Patient Care and Transportation	Rules of Good Body Mechanics Safety Rules
Unit 7, Radiographic Film and the Film Holder	Figure 3. Loading a Cassette
Unit 10, Processing Radiographs	Figure 4. Feeding Films into Automatic Processor

Procedure Sheet 1 for E.E. (1)
Radiology/Imaging

Transporting a Patient by Stretcher

Equipment: Stretcher, sheet, pillow

Procedure:

1. Wash hands.
2. Take stretcher to unit, and explain procedure to patient. Provide privacy.
3. Place stretcher next to bed. Lock wheels on both stretcher and bed.
4. Place sheet over patient, and fanfold bed linens to foot of bed.
5. Lean across stretcher, holding it in place against the bed with your body weight.
6. Ask patient to slowly slide towards you. Help as needed. Keep patient covered during transfer.
7. Place pillow under head, and straighten cover.
8. Secure safety straps around patient.
9. Before moving, check to see if patient has tubing attached. Do not disconnect. Drainage units are moved with the patient and kept below the level of the bladder. At times IVs are moved on a standard attached to a stretcher. These are kept above the level of the arm.
10. Unlock brakes and transport.
11. Move an occupied stretcher slowly and carefully.
12. Stand at the patient's head to push the stretcher.
13. Back the stretcher into an elevator, over a raised area, or down an incline.
14. Set the brakes when you park a stretcher.

Procedure Sheet 2 for E.E. (1)
Radiology/Imaging

Transporting a Patient by Wheelchair

Equipment: Wheelchair, sheet or blanket, robe, slippers

Procedure:

1. Bring wheelchair to unit. Wash hands.
2. Greet patient, and explain procedure. Provide privacy.
3. Place wheelchair at side of bed at a 45° angle to bed, close to either the head or foot. Lock brakes. Cover with a sheet. Elevate footrests.
4. Lower bed and raise head. Lock wheels.
5. Ask patient to move to edge, to sit up, and to dangle legs over side.
6. If the patient is unable to do this, lock arms with the patient and bring to a sitting position. Put your arm under the patient's knees, and swing the patient's legs over the side. Allow patient to rest.
7. Help patient put on robe and slippers.
8. Ask patient to stand.
9. If patient cannot stand, support the patient by sliding your arms under the patient's arms and putting your hands on the back. Help patient slide off edge of bed and stand on the floor.
10. Keeping your hands in the same position, help patient to turn slowly until the back is toward the wheelchair.
11. Have the patient put a hand on the wheelchair. Guide the patient gradually to a sitting position in the chair, using both hands for support. Raise footrests for feet.
12. Arrange robe and then sheet to cover patient. Release brakes, fasten safety belt, and transport patient.



**Procedure Sheet 3 for E.E. (1)
Radiology/Imaging**

Transporting a Patient by Walking (Ambulation)

Equipment: Bathrobe, slippers

Procedure:

1. Wash hands.
2. Greet patient and explain procedure. Provide privacy.
3. Lower bed, elevate head, and instruct patient to move to near edge of bed.
4. Allow patient to dangle feet or assist, if needed.
 - a. Place one arm around patient's shoulder.
 - b. Turn patient to face you and dangle feet over side of bed.
 - c. Allow patient to rest.
5. Assist patient to put on bathrobe and slippers.
6. Ask patient to place both feet on the floor.
7. If patient requires help, support by sliding your arms under the arms and helping patient slide off edge of bed and stand on the floor.
8. Once the patient is standing, let patient try the position for a minute or two to get used to it and to keep his/her balance.
9. When the patient starts walking, ask that one arm be placed around your shoulders, and place your nearest arm around patient's waist for moderate support.
10. Walk slowly with patient and in step. Allow patient to sit down if tired.
11. If patient can walk unsupported but feels unsure, then you should walk slightly behind patient and keep hands on patient's robe belt for support. For minimal support also, the patient may hold your elbow or hand.
12. For maximum assistance, employ two people. One will walk on each side of the patient, offering support.



Dangling

Ambulating Patient



Procedure Sheet 1 for E.E. (2)
Radiology/Imaging

Donning a Hospital Gown

Equipment: Clean hospital gown

Procedure:

1. Wash hands. Greet patient, and escort to dressing room.
2. Explain that radiographic examinations require that patients remove all or part of their clothing. Explain what must be removed.
3. Provide a hospital gown, explaining whether it opens in back or front or is a wraparound with three arm openings. Offer to help.
4. Provide privacy by closing door or drawing curtain.
5. If help is needed because of a disability, clothing is removed from the less affected side first and then from the affected side.
6. The gown should be placed on the affected side first and then on the unaffected side. Secure back ties or fastenings.
7. Take patient to radiographic procedure room.
8. Valuables should not be left in dressing rooms. If the department does not have a designated area for safekeeping of valuables, patients should be instructed to take billfolds, purses, and jewelry with them to the procedure room.

Procedure Sheet 2 for E.E. (2)
Radiology/Imaging

Removing a Hospital Gown

Equipment: Linen hamper, patient's clothing

Procedure:

1. When the radiologic examination has been completed, the patient should be asked to wait until the radiologist has verified that all needed films have been obtained.
2. Once the filming is satisfactorily completed, the patient should be escorted to the dressing room. Offer assistance.
3. If assistance is needed, the gown is removed from the less affected side first and then from the affected side.
4. Clothing is placed on the affected side first and then on the unaffected side.
5. When the patient is dressed, all personal property is collected and returned to the patient.
6. The soiled gown is placed in the clothes hamper.

Procedure Sheet 3 for E.E. (2)
Radiology/Imaging

Communicating with Special Patients

The following guidelines will help health care workers when trying to communicate with patients who have special problems or conditions.

Those Who Are Hearing Impaired

- Get the person's attention before starting to speak.
- Face the person.
- Ask what the best form of communication is for that person.
- Speak clearly and distinctly in a normal tone of voice.
- Remember that the hearing-impaired person may be reading lips.
- Use facial expressions and body gestures to illustrate a point.
- If you cannot understand what the person says, ask him/her to repeat it.
- If necessary, use pencil and paper to write notes.
- If an interpreter is present, speak directly to the hearing-impaired person, rather than the interpreter.

Adapted from Personnel-O-Gram, Number 228, August 1991, The University of Texas at Austin, with permission of Colleen Mehner, OSPER Employment Center.

Those Who Are Visually Impaired

- Introduce yourself, and offer assistance.
- Guide the person to a chair in the waiting room. Explain any anticipated delay.
- Guide the person to and from the dressing room and to and from the treatment area.
- Provide a hospital gown. Assist in dressing, if needed, but allow the patient to determine whether assistance is required.

Procedure Sheet 1 for E.E. (3)
Radiology/Imaging

Checklist for Care of Dressing Room

Equipment: Linen and paper supplies, linen hamper, wastepaper basket

Procedure:

1. Check to see that all personal items have been removed by patients. If any are left, try to locate patient, or return to area designated as "lost and found."
2. Place soiled linens in hamper.
3. Discard paper items in trash.
4. Replenish linen supplies.
5. Replenish paper supplies.
6. Empty wastepaper basket according to departmental policy.

Procedure Sheet 1 for E.E. (4)
Radiology/Imaging

Checking for Accuracy of Patient Data

Equipment: Patient information card or printout, current radiographs, patient information section of radiologist's report

Procedure: Most forms in radiology/imaging have items common to all. Usually, patient data is placed on the forms with an identification plate in an imprinter. All information must be accurate and should be checked repeatedly. Omissions and errors must be corrected. Patient data must be updated as it changes. Below are listed three forms used in radiology which must bear the same accurate patient data.

1. Check for accuracy of data on the patient's *information file card*.
 - a. patient's name, address, sex, and age
 - b. patient's case number
 - c. dates and types of previous procedures
 - d. other information
2. Check for accuracy of the following *information on radiographs*.
 - a. patient's name, address, sex, and age
 - b. patient's case number
 - c. attending physician
 - d. date and type of examination
 - e. other information
3. Check data on the copy of the *radiologist's report* in the departmental file.
 - a. patient's name, address, sex, and age
 - b. patient's case number
 - c. attending physician
 - d. date and type of examination
 - e. other information

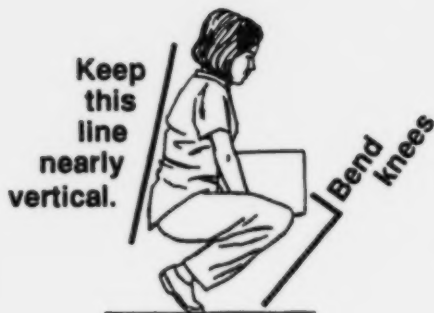
**Procedure Sheet 1 for E.E. (5)
Radiology/Imaging**

Rules When Lifting Heavy Objects

Equipment: Boxes of supplies

Procedure:

1. Size up the load. Never lift more than you feel comfortable lifting. When in doubt, get help.
2. Stand with your feet shoulder width apart or with one foot slightly in front of the other.
3. Squat down by bending your knees. Do not bend at the waist, as this adds stress to the back.
4. Bring the load close to your body.
5. Use a firm grip. Use both hands.
6. Tighten your abdominal muscles, and then lift the load using your leg muscles.
7. Do not twist the body, but turn it as a unit.
8. Avoid pulling heavy objects. Instead, push or roll them to the desired location.



Body mechanics of lifting



Body mechanics used for carrying objects.

Procedure Sheet 1 for E.E. (6)
Radiology/Imaging

The Running Inventory

Equipment: Supply list, supply control card, computer program for supply control

Procedure:

1. Place supply list near supplies posted on a wall cabinet or door or placed in a drawer.
2. Be sure that the supply list contains the names of all items used in the area, the present number on hand, and the reorder point.
3. As a supply is used, the person using it corrects the quantity list.
4. When the reorder point is reached, the person responsible for supplies should reorder after consulting the supply control card.
5. The supply control card will contain this data: name of product, brand, and supplier's address, telephone number, and fax number. The card may also contain the reorder point.
6. The reorder point is when an item should be reordered as determined by such factors as rate of use, shelf life, cost, delivery time, and available storage space.
7. Most large health care facilities use computers to build a database containing all stock in the inventory. Programs are established to register—
 - a. the name of a supply and the amount on hand initially;
 - b. the total number used;
 - c. the total of new supplies added; and
 - d. the reorder point.
8. The computer can be programmed to automatically update the supply list each day upon command. Supplies must be ordered when the reorder point is reached.
9. The success of maintaining an inventory and supplies depends on the willingness of the staff to faithfully correct the totals as they use the supplies. Failure to do so could mean that supplies would not be reordered until all were used.

Procedure Sheet 2 for E.E. (6)
Radiology/Imaging

Receiving Supplies

Equipment: Supplies as received, packing slip or invoice

Procedure:

1. When supplies are delivered to the radiology department, check each package for an invoice or packing slip or both.
 - a. An *invoice* is a list of package contents, the price of each item, and the total charge.
 - b. A *packing slip* indicates the contents of the package.
2. Check that each item listed matches the original order, that each item listed is in the package, and that the original charges are correct.
3. Check for breakage or damage of any item.
4. Some facilities require that the invoice or packing slip be dated and initialed by the person who receives and checks the supplies.
5. Place the invoice, as directed, into a tray or folder to indicate that the goods have been received as ordered, and that payment should be forwarded.
6. If the company used the invoice as a statement to indicate the amount due on the account, it will be indicated on the invoice form.

Procedure Sheet 1 for E.E. (7)
Radiology/Imaging

General Control Measures for Radiation Exposure

The following material was taken from *Guidelines for Protecting the Safety and Health of Health Care Workers*, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, September 1988, pp. 5-56 and 5-57. These measures should be taken to reduce occupational radiation exposure in hospitals:

- Properly mark any rooms housing radiation sources; allow only authorized personnel in the area.
- Enclose all radioactive materials.
- Maintain effective contamination control boundaries around all sources.
- Locate x-ray controls to prevent the unintentional energizing of the unit.
- Check all x-ray machines before each use to ensure that the secondary radiation cones and filters are in place.
- Keep x-ray room doors closed when equipment is in use.
- Equip treatment rooms with radiation monitors, door interlocks, and visual alarm systems.
- In therapeutic radiology settings, check system calibration periodically with lithium fluoride solid-state dosimeters.
- Permit only the patient and trained personnel in the room where portable x-ray units and radioisotopes are used. Provide adequate warning to nearby workers when portable x-rays are about to be taken.
- Clearly identify patients who have received radioactive implants or other therapeutic radiology procedures.
- Follow correct decontamination procedures when control methods fail.
- Lead aprons, gloves, and goggles should be worn by workers located in the direct field or in areas where scatter radiation levels are high.
- Check all protective equipment annually for cracks in the lead.
- Use a thyroid shield and leaded glasses for consistently elevated exposure (such as that occurring during angioplasty).
- Prevent radiation exposure of pregnant workers.

Procedure Sheet 1 for E.E. (8)
Radiology/Imaging

The Patient's Chart

Equipment: Radiology reports

Procedure:

1. The patient's chart in a hospital consists of the following standard chart forms: doctor's order sheet, graphic chart, medical history and physical record, progress notes, nurse's notes, summary sheet, medication record, and routine clinical laboratory reports.
2. In addition to the standard chart forms, special treatments and diagnostic procedures may be ordered. These procedures may be treatments such as respiratory care, physical therapy, or transfusions, and diagnostic procedures in radiology or surgery. Reports of this type, including x-ray examination reports, are placed in a section known as *supplemental chart forms*. The use of this section varies with the facility and the treatments received by the patient.
3. When distributing radiographic reports, be certain to take them to the proper place. Within the hospital, the following locations may be a destination for a radiographic report:

cardiac care unit
emergency room
intensive care unit
medical records room
nursing, medical
nursing, surgical
obstetrics/gynecology
operating room
pediatrics
recovery room

Procedure Sheet 1 for E.E. (9)
Radiology/Imaging

Abbreviations Used in Radiology/Imaging

Procedure: One way to assist in record keeping is to become familiar with abbreviations used in the radiology department.

CT	computed tomography	KVP	kilovolt peak
FDA	Food and Drug Administration	MA	milliamperage
FFD	focal film distance	MPD	maximum permissible dose
GI series	gastrointestinal series	MRI	magnetic resonance imaging
Hz	hertz	N.M.T.	nuclear medicine technologist
IVP	intravenous pyelogram	NRC	Nuclear Regulatory Commission
KUB	kidney, ureter, bladder	R.T.	radiologic technologist
KV	kilovolt	SID	source-to-image distance

For More Advanced Study

Below are suggestions for additional assignments for each unit in *Assisting in Radiology/Imaging*. These may be used for concentrated study in Clinical Rotation for either Health Occupations I or Health Occupations II.

UNIT 1 / The Radiologic Technologist as a Member of the Health Care Team

Make a chart comparing the advantages and disadvantages of being a worker in each of the technologies mentioned in the unit.

UNIT 2 / The Production of X-rays

Explain what a wavelength is and the relationship between its speed and frequency. Look up the wavelengths of visible light, gamma rays, and x-ray radiation. Record these in either ascending or descending order. These values may be found in a physical science text or in a *Handbook of Chemistry and Physics*.

Write a paper explaining the effect of milliamperage, distance, and kilovoltage on the radiographic image.

UNIT 3 / Equipment

Make a list of each major unit of equipment in the radiology department. Be sure to include all technologies, such as sonography. List the manufacturer's name and the approximate cost of each unit.

UNIT 4 / Protection from Radiation and Infection

Over a specific time period (e.g., one week, two weeks), record safety violations which you observe in the radiology department. Finally, evaluate these and suggest methods to improve safety.

Obtain a copy of either the Radiation Control for Health and Safety Act or the Consumer-Radiation Health and Safety Act. Review the Act, and prepare a short summary of it.

Research the effects of radiation exposure and the effects it has on various organs of the body. Describe radiation dermatitis. Evaluate the effects of an overdose on a radiologic technologist and of a massive overdose on a worker in an atomic plant. Develop a report. This may be oral or written in outline or essay form as determined by agreement between student and instructor.

UNIT 5 / Radiology Office Records and Procedures

Develop a flowchart to show the path which a request for an x-ray must follow through the radiology department until the x-ray is completed and filed.

Select ten techniques used in radiography or imaging other than the procedures discussed in this unit. List these. Write a paragraph about each, telling how and for what it is used.

UNIT 6 / Patient Care and Transportation

Obtain both the fire plan and the disaster plan for the radiology department. Write a summary of the responsibilities of radiology personnel for reporting fires and for evacuation when a fire is discovered. Give the location of fire extinguishers and their type. Locate exits and fire doors. Prepare a second summary to specify the role of the radiology department in dealing with a disaster. Indicate where triage and the morgue will be located. Explain how patients will move through the radiology department. Outline procedures used for a bomb threat or a dangerous person loose in the facility.

Devise a list of fifteen safety rules for use in your radiology department dealing with both patient and worker safety.

UNIT 7 / Radiographic Film and the Film Holder

Make a series of drawings to show—

- a. cross section of film;
- b. cross section of film in a holder; and
- c. how to load a cassette.

The drawings in the book may be used for reference but may not be traced. Below or beside the drawing of film, the composition of the layers should be shown.

UNIT 8 / Intensifying Screens

Research the effect of the thickness and crystal size of the phosphor on intensification and image sharpness. Compare the effect of the three screen speeds on intensification. Tell how the crystals act to intensify.

UNIT 9 / Radiographic Darkroom

List the major pieces of equipment found in the darkroom where you work. Determine the approximate cost of each and who the manufacturer was. The cost of built-in items, such as a pass box, can be estimated. Prepare this information as a chart.

UNIT 10 / Processing Radiographs

Prepare a diagram using figure 3, *Sections of an Automatic Processor*, as a basis, and add the names of the chemical solutions used in each phase of automatic processing in the facility where you work. Show the temperature required in each phase.

Prepare an oral report for presentation to your class describing how film is developed at the place where you work. You may use actual films or drawings of film. Arrangements must be made with your instructor for this presentation.

UNIT 11 / Artifacts

Make a series of ten drawings to illustrate ten artifacts that you have seen. Explain what caused each artifact.

Develop a chart for use with automatic processing to show the causes of the artifacts that might occur.

Suggested Answers to 'For More Advanced Study'

UNIT 1 / The Radiologic Technologist as a Member of the Health Care Team

The student should include comments concerning the length of time for training, the advantages that radiologic technologists have for moving into other fields, and the risks of radiation and handling radioactive substances as opposed to other technologies.

UNIT 2 / The Production of X-rays

Wavelength is the distance in the line of advance of a wave from one point to the next point. The discussion below figure 1 should be included and may be expanded. The actual wavelengths should be listed in angstroms for the various colors of light in the visible spectrum, gamma rays, and x-radiation.

The following points should be included in the paper. Brightness increases with increased radiation. Changing the distances from the tube changes the intensity of the image. Kilovoltage changes affect the penetrating power of the x-rays and reduces subject contrast. Changing milliamperage and distance to control intensity does not affect subject contrast. However, changing kilovoltage to control intensity causes changes in subject contrast

UNIT 3 / Equipment

Major items should be listed, not small pieces of equipment. The name of the manufacturer should be exact, but cost can be approximate.

UNIT 4 / Protection from Radiation and Infection

The time period should be set by the student in consultation with the instructor. Methods of improvement should be evaluated in regard to the breaches in safety and asepsis.

Content and length of the review should be determined by the student in consultation with the instructor.

The report on radiation exposure should include the effects on the hair, nails, skin, blood, and reproductive organs. The higher incidence of various forms of cancer should be addressed. The genetic effect and its bearing on future generations should be mentioned.

UNIT 5 / Radiology Office Records and Procedures

The flowchart should be presented as a diagram, showing entry of the request with the patient, checking for previous radiographs, travel through the department, the reporting process, and final filing.

Selection of the ten studies should be made by the student with the approval of the teacher. Each paragraph should name the technique, giving its modality, and explaining how and for what it is used.

UNIT 6 / Patient Care and Transportation

The role of personnel will vary somewhat with the facility. However, the student should include methods for reporting fires; containment; location of fire extinguishers, fire doors, and exits; and the evacuation of patients. The disaster plan should describe the location of triage, how patients will move through radiology, and the location of the morgue. Internal problem situations will include the codes to be called.

Rules will vary. They need not be equally divided between patient and worker but should deal with both.

UNIT 7 / Radiographic Film and the Film Holder

Students' drawings should resemble figures 1, 2, and 3 in Unit 7. Drawings may be in color to differentiate layers. The cross-sectional drawing of film must have the composition of the layers shown somewhere on it.

UNIT 8 / Intensifying Screens

The thicker the layer and the larger the size of the crystal, the more intense the light, but sharpness is decreased because the light spreads. Slow screens have more sharpness while fast screens have more intensification. Medium-speed screens provide a balance. Each phosphor crystal absorbs x-ray energy and emits light.

UNIT 9 / Radiographic Darkroom

A chart should be prepared with columns listing equipment, cost, and manufacturer. Cost should be estimated since some items, such as pass boxes, were built into the room.

UNIT 10 / Processing Radiographs

The diagram will be similar to figure 3 and have added the chemicals listed in table 1. Temperatures should be those shown in figure 2, *Comparison of Manual and Automatic Processing Times and Temperatures*.

Presentations will vary but should include phases and chemicals similar to those outlined in the unit.

UNIT 11 / Artifacts

Drawing size and content will vary. Color may be used where appropriate.

The chart should list the artifact in one column and all factors which may cause it in another column.

Career Resources

Radiology/Imaging

For more information on careers in *radiology*, you may write:

American Registry of Clinical Radiology Technologists
710 Higgins Road
Park Ridge, Illinois 60068

American Registry of Radiographic Technologists
2600 Wayzata Blvd.
Minneapolis, Minnesota 55405

For more information on careers in *magnetic resonance imaging*, you may write:

Galveston College
The University of Texas Medical Branch
Radiology Program
4015 Avenue Q
Galveston, Texas 77550
Attn: Program Director, Radiology and MRI

For more information on careers in *nuclear medicine*, you may write:

Nuclear Medicine Technology Certification Board
P.O. Box 1034
Stone Mountain, Georgia 30086

American Registry of Radiographic Technologists
2600 Wayzata Blvd.
Minneapolis, Minnesota 55405

For more information on careers in *sonography*, you may write:

American Registry for Diagnostic Medical Sonography
32 E. Hollister Street
Cincinnati, Ohio 45219

RADIOLOGY/ IMAGING

Student Study Packet



CLINICAL ROTATION



RADIOLOGY/IMAGING



CLINICAL ROTATION

Student Study Packet

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COMPLIANCE STATEMENT

TITLE VI, CIVIL RIGHTS ACT OF 1964; THE MODIFIED COURT ORDER, CIVIL ACTION 5281, FEDERAL DISTRICT COURT, EASTERN DISTRICT OF TEXAS, TYLER DIVISION

Reviews of local education agencies pertaining to compliance with Title VI Civil Rights Act of 1964 and with specific requirements of the Modified Court Order, Civil Action No. 5281, Federal District Court, Eastern District of Texas, Tyler Division are conducted periodically by staff representatives of the Texas Education Agency. These reviews cover at least the following policies and practices:

- (1) acceptance policies on student transfers from other school districts;
- (2) operation of school bus routes or runs on a non-segregated basis;
- (3) nondiscrimination in extracurricular activities and the use of school facilities;
- (4) nondiscriminatory practices in the hiring, assigning, promoting, paying, demoting, reassigning, or dismissing of faculty and staff members who work with children;
- (5) enrollment and assignment of students without discrimination on the basis of race, color, or national origin;
- (6) nondiscriminatory practices relating to the use of a student's first language; and
- (7) evidence of published procedures for hearing complaints and grievances.

In addition to conducting reviews, the Texas Education Agency staff representatives check complaints of discrimination made by a citizen or citizens residing in a school district where it is alleged discriminatory practices have occurred or are occurring.

Where a violation of Title VI of the Civil Rights Act is found, the findings are reported to the Office for Civil Rights, Department of Health, Education and Welfare.

If there is a direct violation of the Court Order in Civil Action No. 5281 that cannot be cleared through negotiation, the sanctions required by the Court Order are applied.

TITLE VII, CIVIL RIGHTS ACT OF 1964: EXECUTIVE ORDERS 11246 and 11375; TITLE IX 1973 EDUCATION AMENDMENTS: REHABILITATION ACT OF 1973 AS AMENDED; 1974 AMENDMENTS TO THE WAGE-HOUR LAW EXPANDING THE AGE DISCRIMINATION IN EMPLOYMENT ACT OF 1967; VIETNAM ERA VETERANS READJUSTMENT ASSISTANCE ACT OF 1972 AS AMENDED IN 1974.

It is the policy of the Texas Education Agency to comply fully with the nondiscrimination provisions of all federal and state laws and regulation by assuring that no person shall be excluded from consideration for recruitment, selection, appointment, training, promotion, retention, or any other personnel action, or be denied any benefits or participation in any programs of activities which it operates on the grounds of race, religion, color, national origin, sex, handicap, age, or veteran status (except where age, sex, or handicap constitute a bona fide occupational qualification necessary to proper and efficient administration). The Texas Education Agency makes positive efforts to employ and advance in employment all protected groups.

Rotation Objectives

Radiology/Imaging

The student involved in the radiology/imaging rotation will be allowed to observe and assist in the performance of as many departmental functions as possible. The student will apply knowledge gained from assignments to enhance the learning experience. The student will have an opportunity to relate radiology/imaging to patient care and the overall functioning of the health care system. The student will be able to make an informed decision when considering radiology/imaging as a career choice.

The student will be under the direct supervision of a professional licensed in radiology/imaging at all times.

The student will be provided opportunities to—

1. observe levels of training and responsibilities for different levels and modalities;
2. demonstrate an understanding of safety procedures to protect patients and workers;
3. state the functions of equipment in the radiology department;
4. observe and/or assist with transportation and preparation of patients for evaluation and treatments;
4. maintain supplies, equipment, and records as directed;
5. explain the use of radiopharmaceuticals in diagnosis and treatment; and
6. demonstrate an understanding of other imaging techniques besides radiography for the diagnosis of abnormal conditions.

Reference Materials

All reference materials are published by Educational Resources, EIMC, The University of Texas at Austin. The student will be provided the following reference for use in completing worksheets for the rotation in radiology/imaging.

- Fair, Helena J. *Assisting in Radiology/Imaging*. 1992.

One of the following publications will be needed for Worksheet 9: "Body Cavities, Directions, and Planes."

- Pape, Mark. *Physical Therapy Aide*. 1990.
- Williams, Catherine. *Applied Anatomy and Physiology*. 1985.

For additional information on imaging, use the following publication:

- Austin, Bobby, et al. *Introduction to Special Health Technologies*. 1989.

How to Use This Study Packet

Radiology/Imaging

- READ** the reference material. You will need the publications listed under "Reference Materials."
- COMPLETE** the radiology/imaging Worksheets related to the reference material. Some answers will deal specifically with procedures used at the clinical rotation site. These answers must be supplied by your clinical supervisor or through your observations.
- REVIEW** the Procedure Sheets. Studying these techniques during classtime will prepare you for observation at your clinical rotation facility. Not all procedures will be available in every facility. Do not expect to assist with every procedure. Some techniques are restricted to licensed personnel.
- CHECK** your answers, and turn in the Worksheets to your instructor for grading.
- COMPLETE** the Clinical Rotation Activity Checklist by the conclusion of the rotation. This checklist should accompany you each time you report to your assigned rotation department to assure an accurate, dated record of your observations. Ask your clinical supervisor to sign it. Return the completed form to your health occupations teacher.
- TEST** your knowledge of radiology/imaging by taking the test provided by your instructor.

Name _____ Supervisor _____

Date of Rotation: From _____ To _____

Clinical Rotation Activity Checklist Radiology/Imaging

This activity checklist is intended as a guideline for the clinical area. Other activities may be added at the end. The list should be completed, signed by the supervisor, and returned to the health occupations instructor at the end of the rotation.

<i>Activities</i>	<i>Observed</i>	<i>Aided</i>	<i>Date</i>
1. Recognizing levels of training and hierarchy in department	_____ _____	_____ _____	_____ _____
2. Using safety devices a. personnel monitors b. shielding	_____ _____ _____	_____ _____ _____	_____ _____ _____
3. Using aseptic techniques	_____	_____	_____
4. Transporting patients a. wheelchair b. stretcher c. ambulation	_____ _____ _____ _____	_____ _____ _____ _____	_____ _____ _____ _____
5. Using good body mechanics	_____	_____	_____
6. Assisting patient to robe and disrobe	_____	_____	_____
7. Observing positioning of patients	_____	_____	_____
8. Preparing room for treatments	_____	_____	_____
9. Filming a. an extremity b. chest c. vertebral column d. skull	_____ _____ _____ _____ _____	_____ _____ _____ _____ _____	_____ _____ _____ _____ _____
10. Observing procedures using contrast media a. upper GI series	_____	_____	_____

b. lower GI series	_____	_____	_____
c. cholecystogram	_____	_____	_____
d. IVP	_____	_____	_____
11. Observing fluoroscopy			
a. upper GI tract	_____	_____	_____
b. lower GI tract	_____	_____	_____
c. other _____	_____	_____	_____
12. Observing CT scanning			
a. cranial	_____	_____	_____
b. torso study	_____	_____	_____
13. Observing nuclear medicine			
a. in diagnosis	_____	_____	_____
b. in treatment	_____	_____	_____
14. Observing sonography			
a. pelvic examination	_____	_____	_____
b. Doppler	_____	_____	_____
c. echogram	_____	_____	_____
15. Observing special procedures			
a. mammography	_____	_____	_____
b. magnetic resonance imaging	_____	_____	_____
16. Recording results of procedures	_____	_____	_____
17. Maintaining inventory and supplies	_____	_____	_____
18. Maintaining the darkroom	_____	_____	_____
19. Maintaining film processor	_____	_____	_____
20. Describing steps in processing x-rays	_____	_____	_____
21. Distributing reports	_____	_____	_____
22. Assisting in record keeping	_____	_____	_____
23. Dismissing patient	_____	_____	_____
24. Additional activities	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Worksheet 1
Radiology/Imaging

Radiology Department Personnel

OBJECTIVE: To differentiate between personnel in the radiology department

REFERENCE: *Assisting in Radiology/Imaging, Unit 1*

DIRECTIONS: Complete this chart with the appropriate information.

Job Title	Education and Degree	Job Description	Initials
1. radiologist			
2. radiologic technologist or radiographer			
3. nuclear medicine technologist			
4. radiation therapy technologist			
5. diagnostic medical sonographer or ultrasound technician			

6. Give the name of a radiologist where you observe.
7. State the name of the chief radiologist.
8. Give the name of the chief radiologic technologist.

Worksheet 2
Radiology/Imaging

Radiation Safety

OBJECTIVE: To be aware of the principles of radiation protection

REFERENCES: *Assisting in Radiology/Imaging*, Unit 4, and Procedure Sheet 1 for E.E. (7): General Control Measures for Radiation Exposure

DIRECTIONS: Use Unit 4 to locate answers for questions 1-9 and the Procedure Sheet for questions 10-16.

1. Explain the term *ionizing radiation*.
2. List organs particularly affected by radiation.
3. Differentiate between the two types of damage caused by radiation.
4. What is scattered radiation?
5. List two types of radiation monitoring devices for personnel.
6. What are the three principles of radiation protection?
7. List three pieces of protective apparel available for use during fluoroscopic or mobile unit examinations.
8. Explain how patients can be immobilized to avoid radiation exposure.
9. Why is it dangerous for personnel to hold patients in place for radiographic procedures?
10. What is the purpose of the *Guidelines* published by the National Institute for Occupational Safety and Health?
11. State four measures that apply to radiation sources, such as radioactive materials.
12. How are treatment rooms equipped to protect workers from excessive radiation exposure?
13. May the doors be opened during radiographic procedures?
14. Who is allowed in the room when portable x-ray units are in use?
15. How often should lead shielding in equipment be checked?
16. Why would radiology personnel need a thyroid shield?

Worksheet 3
Radiology/Imaging

Identification of Hazardous Materials

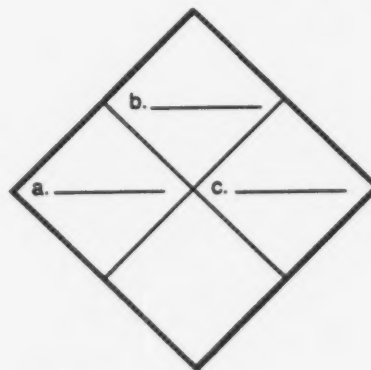
OBJECTIVE: To recognize warning signs

REFERENCE: Information Sheet for Worksheet 3

DIRECTIONS: Use the Worksheet to answer these questions.

1. Where is the diamond-shaped emblem supposed to be displayed?
2. What is the purpose of the symbol?
3. The diamond pattern is printed below. Write the following words in the quarter where they belong:

Flammability
Health Hazard
Reactivity



4. Why is the small diamond at the bottom left blank?
5. Cite other areas which must be identified by a tag or sign.
6. Describe the tag used to label radioactive substances.
7. By law, where are tags and labels placed when radionuclides are used in nuclear medicine?
8. Explain the duties of a radiation protection officer.
9. What is the name of the radiation protection officer in the facility where you observe?

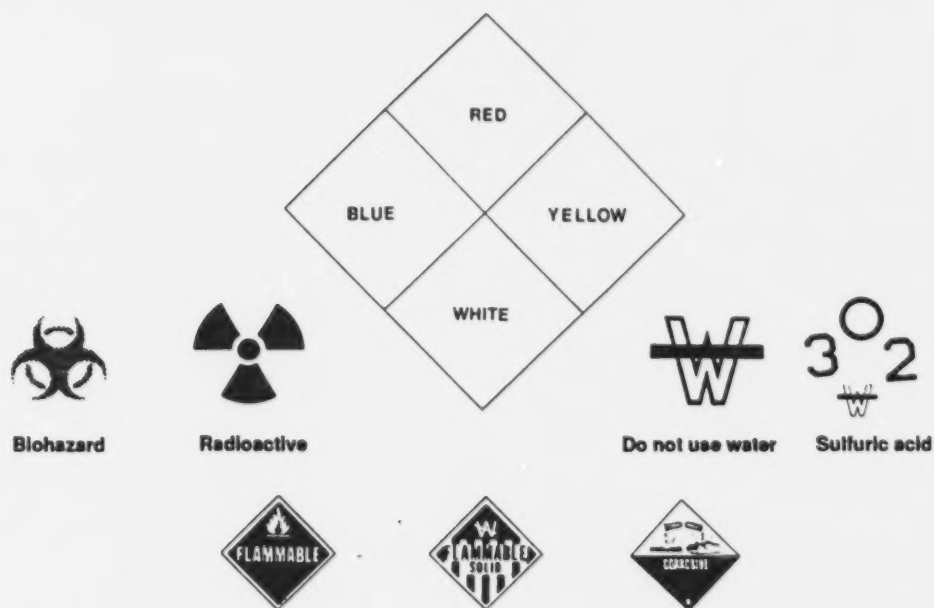
Information Sheet for Worksheet 3 Radiology/Imaging

Identification of Hazardous Materials

The National Fire Protection Association (NFPA) has devised an emblem that indicates the presence of hazardous materials at a glance. All facilities that must have hazardous materials are advised to put this emblem on the outer door. Also, the emblem should be on the door of any room where hazardous materials are used or stored. This makes it easier for emergency personnel to determine problems quickly.

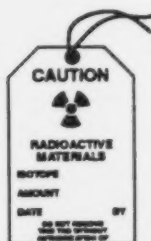
The symbol is a diamond divided into four equal parts, or smaller diamonds. Each small diamond is a different color. Blue indicates Health Hazard, red is for Flammability, and yellow indicates Reactivity (Stability). These are always arranged in the same pattern (see below). Health Hazard (blue) is indicated in the left diamond, Flammability (red) is at the top, and Chemical Reactivity (yellow) is on the right. Numbers are displayed in the diamonds. These range from 0 to 4 to indicate the level of risk, with 4 being the most risky or hazardous.

The bottom diamond is left blank. It is to be used to identify other hazards, such as "Biohazard," "Radioactive," "Do not use water," "Flammable," "Flammable solid," "Corrosive," and "Sulfuric acid."



Reprinted by permission from NFPA 49-1975, Hazardous Chemical Data.
Copyright © 1975, National Fire Protection Association, Boston, Mass.

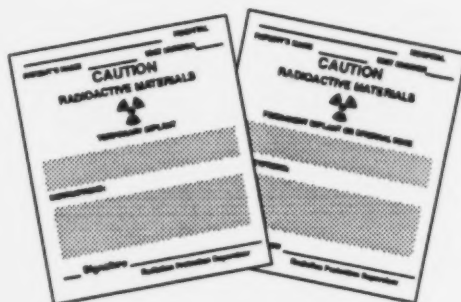
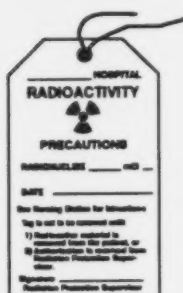
All areas where radioactive materials and radiation producing machines are used must be properly and conspicuously identified. Federal and state laws require this. Signs must be yellow with the three-bladed propeller symbol for radioactivity in purple or red, as specified by the National Council on Radiation Protection and Measurements. There may be other warnings on the signs, such as "Caution—Radiation Area." When patients receive therapeutic amounts of radionuclides, warning labels and tags must be placed on patients, their charts, and attached to their beds. Examples of these signs and tags are given below.



Tag for a Container



Signs



Label

Use With Patients In Nuclear Medicine

Hospitals are required to have a radiation protection officer who is responsible for all aspects of radiation safety in the facility. The officer must monitor the exposure levels of both patients and health care workers, maintain an inventory of all radioactive substances that enter and leave a hospital, and train those who handle radioactive substances.

Worksheet 4
Radiology/Imaging

Medical Asepsis

OBJECTIVE: To be aware of methods by which disease is spread

REFERENCE: *Assisting in Radiology/Imaging*, Unit 4

DIRECTIONS: Answer these questions.

1. Define *medical asepsis*.
2. Name and describe two types of barriers.
3. List three methods by which disease is spread.
4. How may radiology department personnel protect themselves against disease?
5. What methods can be employed with equipment and supplies to prevent the spread of disease?

Worksheet 5
Radiology/Imaging

Transporting Patients

OBJECTIVES: To transfer patients safely to and from radiology/imaging

REFERENCES

AND DIRECTIONS: Use *Assisting in Radiology/Imaging*, Unit 6, for questions 1-4. Use Procedure Sheets 1 through 3 for E.E. (1) to answer questions 5-10.

1. Name three methods by which patients may be transferred.
2. When moving a patient between a stretcher and a radiographic table, how many people should be involved?
3. Develop four safety rules for use with patients on stretchers.
4. Name and describe three levels of support for ambulation.
5. If you go to transport a patient by stretcher and discover that the patient has a drainage unit and intravenous fluids attached, what should you do?
6. Should the wheelchair be placed at the head or foot of the patient's bed?
7. How does the assistant help the patient locate the wheelchair to sit in it?
8. Mention two items to be checked before the patient is transported from a hospital room by wheelchair.
9. What does the term *dangling* mean?
10. When ambulating a patient, where is the patient's arm placed for moderate support?

Worksheet 6
Radiology/Imaging

Body Mechanics

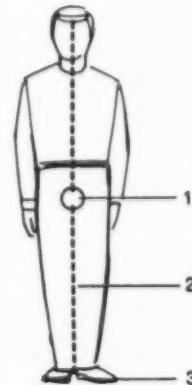
OBJECTIVE: To demonstrate good body mechanics when moving patients or supplies

REFERENCES: *Assisting in Radiology/Imaging*, Unit 6
Procedure Sheet 1 for E.E. (5)

DIRECTIONS: Use both references to answer the questions.

1. Define the term *body mechanics*.
2. To what does *alignment* refer?
3. Why is it important to follow the rules of good body mechanics?
4. How does one know when an object is balanced?
5. What is the point at which the mass of a body is centered? Relate this point to the line of gravity.
6. What is the *base* of support?
7. Identify and label these on the drawing:

- a. base of support
- b. center of gravity
- c. line of gravity



8. State four general rules of good posture.
9. List five rules of body mechanics.
10. Describe how directions should be given to patients.
11. What problem is created when bending at the waist during lifting?
12. How does one avoid moving heavy objects by pulling?

Worksheet 7
Radiology/Imaging

Linens and Disposable Supplies

OBJECTIVE: To determine the types of supplies used and methods for their disposal

REFERENCES: *Assisting in Radiology/Imaging, Unit 6*
Procedure Sheet 1 for E.E. (2), Donning a Hospital Gown
Procedure Sheet 2 for E.E. (2), Removing a Hospital Gown
Procedure Sheet 1 for E.E. (3), Checklist for Care of Dressing Room

DIRECTIONS: Answer questions 1-4 using the section on "Dismissing the Patient" in Unit 6 and the Procedure Sheets.

1. If help is needed when donning a hospital gown, from which side is the patient's clothing removed first?
2. On which side is the hospital gown placed first when helping to dress?
3. How are patients' personal items cared for during procedures?
4. What steps should be followed after the patient is dismissed?

DIRECTIONS: Answer these questions from your observations at the clinical rotation facility.

5. Are hospital gowns reusable or disposable?
6. Are other reusable linens used besides gowns? List these.
7. Where is the soiled linen hamper located?
8. Where are disposable plastic items placed for disposal?
9. Where are disposable paper items placed for disposal?
10. Who is responsible for keeping the dressing rooms clean?
11. Who is responsible for restocking supplies?
12. Make one suggestion for improving the supply arrangements of the dressing rooms.

Worksheet 8
Radiology/Imaging

Communicating with Patients

OBJECTIVE: To communicate effectively with all patients

REFERENCES: *Assisting in Radiology/Imaging*, Unit 5 and Unit 1
Procedure Sheet 3 for E.E. (2)

DIRECTIONS: Use material in both units to find answers to the questions.

1. Describe the proper way to answer the telephone in the radiology department.
2. List patients who require special attention.
3. List ways that an assistant can communicate with a patient who is blind.
4. Explain how to communicate with a deaf patient.
5. What is nonverbal communication?
6. How does a worker reinforce verbal communication?
7. Why should an aide in radiology be familiar with examinations and their required preparations?
8. Explain the differences in preparation for a radiologic examination of inpatients and outpatients.
9. What is confidential or privileged communication?
10. Who gives the patient the results of an x-ray examination?
11. What rights does the patient have in regard to personal information obtained by the radiology department?

Worksheet 9
Radiology/Imaging

Body Cavities, Directions, and Planes

OBJECTIVES: To identify the general anatomical plan of the body

REFERENCES: *Applied Anatomy and Physiology*, Unit 1
Physical Therapy Aide, Unit 3

DIRECTIONS: Using the terms provided, label the figures below.

Figure I: cranial cavity
 vertebrae
 spinal cavity
 thoracic cavity
 diaphragm
 abdominal cavity
 pelvic cavity

A. _____
B. _____
C. _____
D. _____
E. _____
F. _____
G. _____

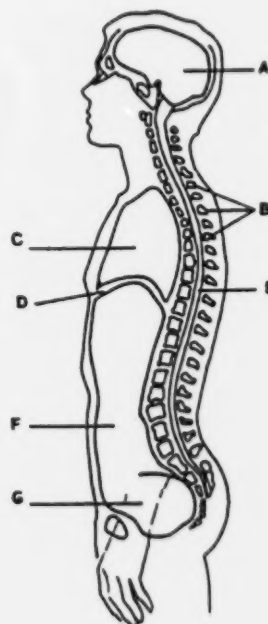


Figure II: cranial
frontal plane
posterior or dorsal
anterior or ventral
caudal

A. _____
B. _____
C. _____
D. _____
E. _____

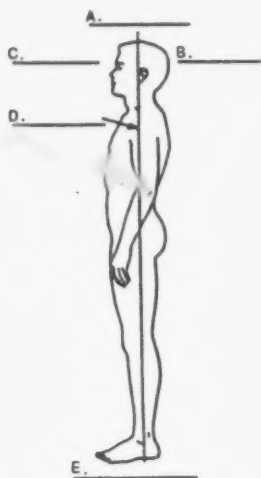
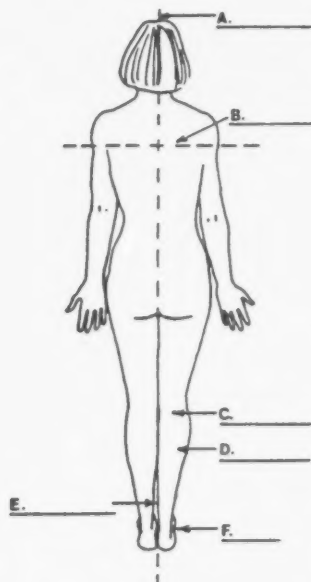


Figure III: transverse plane
sagittal plane
proximal end of lower leg
medial surface
distal end of lower leg
lateral surface

A. _____
B. _____
C. _____
D. _____
E. _____
F. _____



Worksheet 10
Radiology/Imaging

Radiographs and Imaging Records

OBJECTIVES: To become familiar with the names used to identify radiographs and imaging records

REFERENCE: Glossary of Radiographic Terms

DIRECTIONS: Use the Glossary to locate answers to these questions.

1. Select and list the names of nine types of imaging procedures relating to the urinary system.
2. When you see the prefix *cine* at the beginning of a term, (a) what type of record will be available? (b) Give two examples, and tell the purpose of the imaging.
3. Differentiate between a cholangiogram and a cholecystogram.
4. What is the meaning of the initials *KUB*?
5. Which imaging technique is used for the following imaging records?
 - a. angiogram
 - b. echogram
 - c. laminogram
 - d. nephrotomogram
 - e. photoscan
 - f. scout film
 - g. sonogram (Doppler)
 - h. xeroradiogram
6. Name three procedures for examination of the colon.
7. When you see the prefix *pneumo* at the beginning of a term, what contrast medium has usually been used for the visualization? Suggest a second possibility, and give the name of the image produced by this procedure.
8. Name five procedures that use air as a contrast medium. List the organs for which air is appropriate.
9. Which organ is imaged for the hepatic echogram?
10. Give another name for a routine chest film which did not require use of radiopaque materials.
11. What type of tissue is imaged for a mammogram?

Worksheet 11
Radiology/Imaging

Basic X-ray Equipment

OBJECTIVE: To be familiar with radiographic equipment

REFERENCE: *Assisting in Radiology/Imaging*, Unit 3 and Unit 5

DIRECTIONS: Answer these questions.

1. Who discovered x-rays?
2. List the major components of the equipment in the procedure room.
3. Where is the x-ray tube found?
4. In the place where you observe, does the tube stand move on tracks found on the floor or on the ceiling or on both?
5. What is the purpose of the placement controls?
6. What is the purpose of the control panel?
7. Where is the control panel located in the place where you observe?
8. Why is a generator needed?
9. What is the purpose of the table?
10. A patient is scheduled for a pyelogram to examine the urinary system. Why does this patient need a laxative as part of his or her preparation?
11. Explain what contrast media are and why they are used.
12. Name materials used as contrast media.
13. What problems may be encountered with the use of contrast media?
14. How are these allergic reactions manifested?

Worksheet 12
Radiology/Imaging

Fluoroscopy

OBJECTIVE: To appreciate the uses of fluoroscopy and how it differs from other techniques

REFERENCE: *Assisting in Radiology/Imaging*, Unit 3 and Unit 5

DIRECTIONS: Use the section on "Fluoroscopy" to answer these questions.

1. What is fluoroscopy?
2. Describe the advantage of using fluoroscopy over conventional x-rays.
3. What is the disadvantage of using fluoroscopy?
4. How is this disadvantage overcome?
5. What is a spot film?
6. Explain how fluoroscopy is combined with radiography for—
 - a. the upper GI series
 - b. the lower GI series

Worksheet 13
Radiology/Imaging

Tomography and Computed Tomography

OBJECTIVE: To understand the differences and uses of tomography and computed tomography

REFERENCE: *Assisting in Radiology/Imaging*, Unit 3 and Unit 5

DIRECTIONS: Use those sections on "Tomography," "Computed Tomography," and "CT Scanning" in Unit 3 and Unit 5 to find answers to these questions.

1. Explain how a tomogram is produced.
2. Describe the appearance of the images on the tomogram.
3. How does computed tomography differ from tomography?
4. Explain the purpose of a gantry.
5. For what types of examinations is the CT scanner used?
6. For what abnormal conditions is the physician usually searching with this imaging technique?
7. What is the record of imaging called in tomography?

Worksheet 14
Radiology/Imaging

Sonography

OBJECTIVE: To be able to describe sonographic techniques and their applications for diagnosis

REFERENCES: *Assisting in Radiology/Imaging*, Unit 3 and Unit 5
Glossary of Radiographic Terms

DIRECTIONS: Use the sections on "Sonography" and "Ultrasound" in Units 3 and 5 to answer the questions.

1. Define *sonography*.
2. What name is applied to the image that is produced?
3. In what forms may the ultrasound report be presented?
4. List the parts of the ultrasound machine.
5. Each sonographic probe functions as a transducer. Explain how a transducer operates.
6. What body parts are most often examined by ultrasound?
7. Explain what happens during lithotripsy.
8. Echocardiography is the name of the process. On which body organ is this performed? What type of imaging is prepared?
9. How is the Doppler effect used in sonography?
10. Below are terms listed in the Glossary relating to sonography. Identify each of these.
 - a. abdominal echogram
 - b. contact scanning
 - c. echogram
 - d. echoencephalogram
 - e. gynecologic ultrasonogram
 - f. hepatic echogram

g. nephrosonogram

h. obstetric ultrasonogram

i. renal sonogram

j. ultrasonogram (Doppler)

Worksheet 15
Radiology/Imaging

Magnetic Resonance Imaging

OBJECTIVE: To be familiar with MRI

REFERENCE: *Assisting in Radiology/Imaging*, Units 3 and 5

DIRECTIONS: Use the sections on "Magnetic Resonance Imaging (MRI)" in both units to answer these questions.

1. Define *magnetic resonance imaging*.
2. Compare the MRI scanner to the CT scanner in these areas:
 - a. similarities
 - b. differences
 - c. equipment in gantry
 - d. additional equipment
3. Describe the process of imaging using an MRI scanner.
4. List the types of people on whom MRI cannot be used.
5. List advantages in using MRI scanning instead of CT scanning.

Worksheet 16
Radiology/Imaging

Nuclear Medicine

OBJECTIVE: To determine how radioactive materials are used to diagnose

REFERENCES: *Assisting in Radiology/Imaging*, Unit 3 and Unit 5
Glossary of Radiographic Terms

DIRECTIONS: Answers to the questions will be found in sections on "Nuclear Medicine" in both units. Use the Glossary for questions 9 through 11.

1. How are nuclear materials used in nuclear medicine?
2. By what means do patients receive the radioactive substances used for visualization?
3. Explain the purpose of a gamma camera.
4. Explain how the gamma rays are converted into a picture record.
5. State another name for the gamma camera, and explain why this name is appropriate.
6. What is a well counter?
7. What is emission scanning?
8. List some of the most common types of scans.
9. What is the record of a nuclear medicine procedure called? (List five names.)
10. What is a radioiodine uptake study?
11. Differentiate between a photoscan and a scintillation scan.

Worksheet 17
Radiology/Imaging

Patient Records

OBJECTIVE: To place pertinent information on patient's chart

REFERENCES: *Assisting in Radiology/Imaging*, Unit 5
Procedure Sheet 1 for E.E. (4), "Checking for Accuracy of Patient Data"

DIRECTIONS: Answer questions using the section on "Record Keeping."

1. Who orders all radiographic examinations?
2. Look at figure 1, *Typical Radiographic Request Form*. What general types of information are recorded on this form?
3. Obtain a request form from the place where you observe. Note and record any differences between it and the form shown in figure 1.
4. When a request for a radiograph is received, what type of patient information should be checked?
5. Refer to figure 2, *Patient Information Card*. Determine what two important pieces of data are obtained from this card, besides personal data, if the card already exists in departmental files.
6. Describe two methods used for putting identification on a radiograph.
7. What must be included as part of this identification besides the patient's name and personal data?
8. Refer to figure 4, *Radiographic Film Folder Using Terminal Digit System*. Explain how this case numbering system is used to identify a patient.
9. Is this system used where you observe? If not, explain the facility's system of radiographic folder identification.
10. How many copies of the radiologist's report are made, and where do these go?
11. Name the three records in the radiology department which must have identical patient data.

Worksheet 18
Radiology/Imaging

Charting

OBJECTIVE: To locate radiographic reports in a hospital chart and to recognize abbreviations used on the chart

REFERENCES: Procedure Sheet 1 for E.E. (8)
Procedure Sheet 1 for E.E. (9)

DIRECTIONS: Answer these questions using the Procedure Sheets.

1. List the eight standard chart forms.
2. Into what section of the chart are reports from radiology placed?

DIRECTIONS: Rewrite the sentences using complete terms for the abbreviated words.

3. Dr. Smith ordered a GI series on Mrs. Black.
4. The R.T. was asked to perform a CT scan.
5. MRI and CT are forms of imaging.
6. KVP, KV, and MA are important in controlling the generator which produces x-radiation.
7. Both the FDA and the NRC regulate radioactive materials with which the N.M.T. works.
8. An IVP was scheduled for Tues.
9. MPD information travels with the R.T. when the R.T. changes jobs.
10. The FFD and SID are both distances measured from the point of origin of the x-rays.
11. A unit of measurement of wave frequency is the Hz.

Worksheet 19
Radiology/Imaging

Maintaining Film Supplies

OBJECTIVE: To become familiar with types, size, and storage of film

REFERENCE: *Assisting in Radiology/Imaging*, Unit 7 and Unit 8

DIRECTIONS: Use the material in both units to answer the questions.

1. Describe the composition of radiographic film.
2. Of what is film emulsion made?
3. List the two main types of film, and explain how each is used.
4. Below are listed other types of x-ray film. Describe how these are used.
 - a. periapical film
 - b. bitewing film
 - c. occlusal film
 - d. renogram
 - e. dosimeter film
 - f. duplicating film
5. How does duplicating film differ from other film?
6. Cite the ideal climatic conditions for film storage.
7. Describe other factors to remember when storing film.
8. Explain the purpose of a film holder.
9. What are the standard film sizes?
10. Of what is a film holder or cassette composed?
11. State the purpose of an intensifying screen, and tell where it is found.
12. What is a phosphor?
13. Describe the care given to intensifying screens to maintain them properly.

Worksheet 20
Radiology/Imaging

Maintenance of the Darkroom

OBJECTIVE: To determine factors in the effective design and maintenance of a darkroom

REFERENCE: *Assisting in Radiology/Imaging*, Unit 9

DIRECTIONS: Refer to Unit 9 to answer these questions.

1. Determine the colors and materials *suggested* for use in the darkroom on the—
 - a. loading bench
 - b. walls
 - c. floor
2. Determine the colors and materials *present* in the darkroom of the facility where you rotate on the—
 - a. loading bench
 - b. walls
 - c. floor
3. Differentiate between the “wet” and “dry” sides of the darkroom.
4. Cite the optimum temperature and humidity recommended for a darkroom.
5. Point out the reason for having two type of lights in the darkroom.
6. Actually, what is a safelight?
7. Why should a cassette containing film be placed in the pass box facing in the same direction each time when sending it to the darkroom?
8. Describe the construction of a film bin in a darkroom.
9. What safety precaution may be built into the electrical wiring system to prevent exposure of film in the bin?
10. How is boxed film stored?
11. What should an assistant do as supplies are used and replacements arrive?
12. State three rules to remember for keeping the darkroom clean.

Worksheet 21
Radiology/Imaging

Receiving and Maintaining an Inventory of Supplies

OBJECTIVE: To have supplies available and in sufficient quantities as needed

REFERENCES: Procedure Sheet 1 for E.E. (6)
Procedure Sheet 2 for E.E. (6)

DIRECTIONS: Answer these questions.

1. Where should a running inventory be kept?
2. List the categories of items to be included on the supply list.
3. What is a reorder point?
4. Cite an advantage to keeping the inventory on a computer program.
5. What will cause the running inventory system to be unsuccessful?
6. Does the radiology department where you observe use a running inventory?
Is it computer-based?
7. When supplies are delivered, what form will accompany them?
8. Differentiate between a packing slip and an invoice.
9. Outline the procedure to be followed when a package of goods is received on an order.

Worksheet 22
Radiology/Imaging

Conservation of Supplies

OBJECTIVE: To realize the importance of conserving supplies by prudent usage

REFERENCE: *Assisting in Radiology/Imaging*, Unit 10 and Unit 11

DIRECTIONS: Use sections on "Automatic Processing" and "Silver Recovery" to answer these questions.

1. Explain what happens during automatic processing when film is fed into the processor.
2. What stops this process?
3. Why is it important to feed the film into the processor in the specified way?
4. Consult figure 4, *Feeding Films into Automatic Processor*.
 - a. Name the sizes of film that can be fed two at a time.
 - b. State the maximum film width that may be fed into the processor.
5. Define the term *silver recovery*.
6. From where is the silver obtained?
7. How does this silver get into the fixer?
8. Why is silver recovery important?

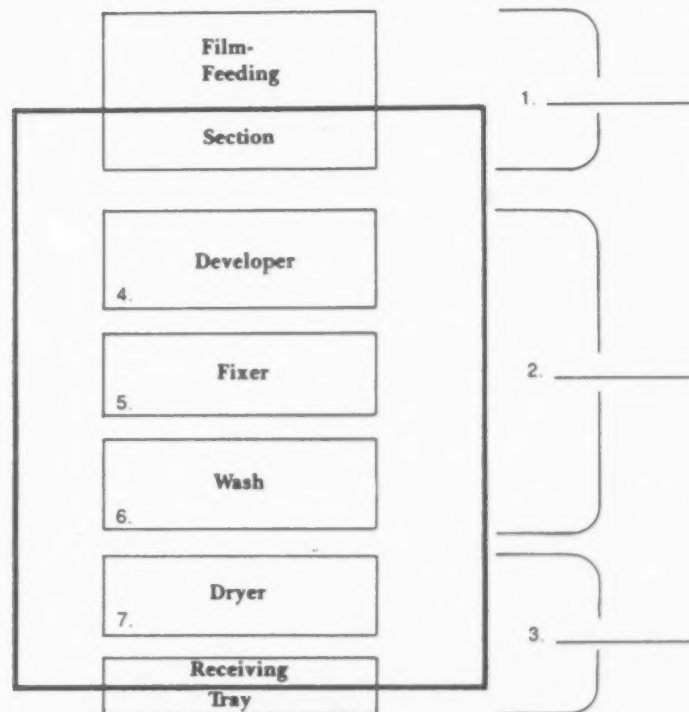
Worksheet 23
Radiology /Imaging

Equipment for Processing

OBJECTIVE: To become familiar with automatic processing equipment

REFERENCE: *Assisting in Radiology/Imaging*, Unit 10

DIRECTIONS: Below is a drawing of the sections of an automatic processor. To the right, give the names of the three main sections. Write the temperature and time required for each of the four processing sections in the squares of the drawing.



Worksheet 24
Radiology/Imaging

Organization of the Hospital

OBJECTIVE: To identify departments and how they are organized within a hospital

REFERENCE: *Assisting in Radiology/Imaging*, Unit 1

DIRECTIONS: Answer these questions.

1. What is the purpose of the Board of Trustees in a hospital?
2. Who administers the established policy?
3. Give the name of the hospital administrator in the facility where you observe.
4. What is the next level of organization below assistant administrator?
5. Why are workers organized into health care teams?
6. Who is the head of the health care team?
7. List other professionals included on the team.

Worksheet 25
Radiology/Imaging

The Nature and Production of X-radiation

OBJECTIVE: To be able to explain the nature of x-rays

REFERENCE: *Assisting in Radiology/Imaging*, Unit 2

DIRECTIONS: Give complete answers to these questions.

1. Of what type of radiation are x-rays?
2. Describe the manner in which x-rays move.
3. The waves of x-radiation are short. What property does this give these rays?
4. Describe the manner in which x-rays travel and their speed.
5. Mention four other properties of x-rays.
6. How are x-rays produced?
7. Explain the process and name the parts required for production of x-radiation.
8. Of what material is the anode composed?
9. How much of the energy in the beam becomes x-ray energy?
10. Name the major parts of the x-ray tube.
11. What is the focusing cup?
12. What is the focal spot?
13. Describe the glass envelope.
14. Which generator control selects the amount of current to the filament of the x-ray tube?
15. Which generator control selects the penetrating ability of the x-ray beam?
16. Which generator control determines the length of time of the exposure?

Glossary of Radiographic Terms

abdominal echogram—ultrasound study of the organs in the abdominal area.

air contrast enema examination—patient is given a small amount of barium to coat the colon walls, and then air is injected to distend the colon for visualization.

angiogram—one of a series of x-rays of blood vessels taken after injection of a radiopaque substance. Angiograms may be aortic, cardiac, cerebral, or vertebral.

aortogram—x-ray of the aorta after injection of a radiopaque substance.

arteriogram—visualization of an artery after use of a contrast medium.

arthrogram—radiogram of a joint using contrast media.

barium enema examination—patient is given an enema of a barium solution to visualize the colon on x-ray.

bronchogram—x-ray of bronchial tree including the lungs.

chest film—routine x-ray of the chest; may be postero-anterial or lateral.

cholangiography—visualization of the bile ducts after introduction of a radiopaque substance.

cholecystogram—radiogram of the gallbladder after introduction of a contrast medium.

cineangiocardiology—use of motion picture film to record heart structure and movement.

cinecystogram—motion picture of urinary system function, especially the bladder, using a radiopaque material.

contact scanning—ultrasound studies done with direct skin contact through a coupling gel.

cystogram—x-ray of urinary bladder.

discogram—use of contrast media injected into a vertebral disk to produce an image.

echogram—photograph produced by ultrasound techniques.

echocardiogram—visualization of internal structures of the heart by ultrasound.

echoencephalogram—visualization of brain structure by ultrasound.

flat plate—x-ray of a body part or foreign object in tissue without use of radiopaque materials.

gynecologic ultrasonograms—use of ultrasound to detect abnormalities of the female reproductive system, fetal placement, or presence of lesions.

hepatic echogram—ultrasound photograph of the liver.

intravenous pyelogram (IVP)—radiographic examination of the urinary system using a radiopaque contrast medium.

KUB (kidney, ureter, bladder)—x-ray study of urinary system without contrast media.

laminogram or tomogram—x-ray appears as a slice (layer) through the tissue under study.

lower gastrointestinal examination or barium enema—a series of radiograms to visualize the colon following administration of a contrast medium.

lymphadenogram—use of a contrast medium to visualize a lymph node on an x-ray.

mammogram—x-ray of the breast.

myelogram—injection of a radiopaque dye or air to visualize the spinal cord and spinal canal.

nephrogram—radiographic study of kidneys; may be used to compare them with each other.

nephrotomography—sections of the kidney through body section scanning.

obstetric ultrasonograms—sonograms showing fetal abnormalities and placement.

pancreatic echogram—ultrasound study of the pancreas.

pelvic pneumogram—radiographic studies of the pelvic area after the injection of carbon dioxide into the peritoneal cavity.

pelvimetry—use of radiographic studies to determine obstetric measurements of the female pelvis.

pneumoarthrogram—radiogram using air injection into the joint for visualization and evaluation.

pneumocystogram—x-ray of the bladder after the introduction of air into it.

radioiodine uptake study—oral administration of radioactive iodine for studies of the thyroid gland in nuclear medicine.

renal sonogram or *nephrosonogram*—use of ultrasound to visualize the kidneys.

salpingiogram—use of a radiopaque dye for x-ray study of the fallopian tubes.

scan—imaging done in nuclear medicine by the deposit of a radionuclide.

a. *photoscan*—recorded on x-ray film.

b. *scintigram*—record produced when a radioactive substance is introduced into the body and scanned; intensity varies due to the amount of substance accumulated in body tissues.

c. *scintillation scan (scintiscan)*—pattern recorded by a scintillation counter to determine presence of neoplasms or lesions.

scout film—a screening or preliminary x-ray of the abdominal area to rule out or include certain disease before administration of contrast media.

sonogram—photographic image produced by ultrasonography.

splenogram—x-ray of the spleen.

spot film—an x-ray taken during fluoroscopy of a specific structure.

tomography—image produced by moving x-ray tube and film in opposite directions during exposure to provide a clear image with blurred supporting structures.

ultrasonogram (Doppler)—using ultrasound to measure blood flow.

upper gastrointestinal examination (upper GI series)—a series of radiograms to visualize the upper digestive tract following administration of a contrast medium.

ureterogram—x-ray of a ureter.

urethrogram—x-ray of the urethra and may include the prostate.

urogram—radiogram of the urinary tract using radiopaque materials.

venogram—visualization of a vein by use of a contrast medium.

ventriculogram—using an injection of air to visualize the ventricles of the brain.

xeroradiogram—using a selenium-coated plate for a radiogram and developing the plate without liquid chemicals.

Career Resources

Radiology/Imaging

For more information on careers in *radiology*, you may write:

American Registry of Clinical Radiology Technologists
710 Higgins Road
Park Ridge, Illinois 60068

American Registry of Radiologic Technologists
2600 Wayzata Blvd.
Minneapolis, Minnesota 55405

For more information on careers in *magnetic resonance imaging*, you may write:

Galveston College
The University of Texas Medical Branch
Radiology Program
4015 Avenue Q
Galveston, Texas 77550
Attn: Program Director, Radiology and MRI

For more information on careers in *nuclear medicine*, you may write:

Nuclear Medicine Technology Certification Board
P.O. Box 1034
Stone Mountain, Georgia 30086

American Registry of Radiographic Technologists
2600 Wayzata Blvd.
Minneapolis, Minnesota 55405

For more information on careers in *sonography*, you may write:

American Registry for Diagnostic Medical Sonography
32 E. Hollister Street
Cincinnati, Ohio 45219